PROC. ENTOMOL. SOC. WASH.
87(1), 1985, pp. 85–93

SEASONAL HISTORY, HOST PLANTS, AND NYMPHAL DESCRIPTIONS OF *ORTHOCEPHALUS CORIACEUS*, A PLANT BUG PEST OF HERB GARDEN COMPOSITES (HEMIPTERA: MIRIDAE)

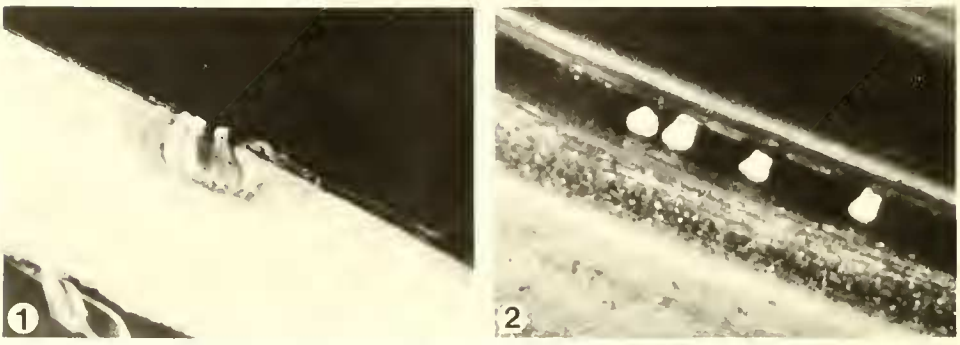
A. G. Wheeler, Jr.

Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg, Pennsylvania 17110.

Abstract.—The plant bug *Orthocephalus coriaceus* (F.), common throughout most of Europe and known from northern Africa, was first recorded from the New World (Maine) in 1917. The known North American distribution is given, with Ohio and Virginia listed as new state records. Seasonal history of this univoltine mirid is summarized for a population studied in southcentral Pennsylvania on mugwort, *Artemisia vulgaris* L., during 1983. A list of host plants observed in the eastern United States, all members of the Asteraceae, is provided, and foliar damage to herb garden composites is described. All nymphal stages are described; the fifth instar is illustrated.

Orthocephalus coriaceus was described by Fabricius (1776). Even though Thomson (1871) and Reuter (1888) established *O. mutabilis* (Fallén) as a junior synonym of *coriaceus*, the former name was used in much of the European and North American literature until Carvalho's (1955) confirmation of the synonymy. This mirid of the orthotyline tribe Halticini is widely distributed in Europe and is known from northern Africa (Carvalho, 1958). According to Kullenberg (1944) and Southwood and Leston (1959), it typically is found in dry, open, sandy areas where it feeds on various composites and occasionally on plants of the Lamiaceae (= Labiatae) and Rubiaceae. In Sweden, Kullenberg found that yarrow, *Achillea millefolium* L., and tansy, *Tanacetum vulgare* L., are favored hosts. *O. coriaceus* attacks stems and leaves, especially the veins, of its hosts; adults have been observed to feed on inflorescences of grasses. Eggs are inserted in host stems, with furrows of the middle and lower portions usually selected as oviposition sites. Overwintering occurs in the egg stage, and adults begin to appear in mid- to late June; adults are present until late July or early August. Males and females may be either macropterous or brachypterous (Kullenberg, 1944; Southwood and Leston, 1959).

Knight (1917) first reported *O. coriaceus* from North America based on specimens from wild daisies at Orono, Maine. In recording it from oxeye daisy, *Chrysanthemum leucanthemum* L., at Ithaca, New York, Knight (1918) suggested that this species had been accidentally introduced with "egg-infested plant stems used for packing or in hay." In Maine, Stear (1923) noted that *O. coriaceus* injured *C. leucanthemum*, the "plants being undersized and poorly developed." Other



Figs. 1–2. Eggs of *Orthocephalus coriaceus* in stem of chicory. 1, Split stem showing inserted eggs. 2, Opercula protruding from stem surface.

North American records for this mirid are Pennsylvania (Knight, 1941), Connecticut (Slater, 1974), Ontario (Reid et al., 1976), West Virginia (Wheeler et al., 1983), and Quebec (Larochelle, 1984). The following are new records based on specimens in the insect collections of the Pennsylvania Department of Agriculture (PDA) and U.S. National Museum of Natural History (USNM). OHIO: Wayne Co., Wooster, 15 May 1953, R. W. Rings (USNM); VIRGINIA: Highland Co., near McDowell, 15 July 1984, A. G. Wheeler, Jr. (PDA).

Except for the note on injury to oxeye daisy (Stear, 1923), the habits of *O. coriaceus* in North America are unknown. In this paper the seasonal history, hosts, and damage to herb garden plants are recorded. The nymphal stages are described, and the fifth-instar nymph is illustrated.

Methods and Study Sites

The plants used by *O. coriaceus* for development ("breeding hosts") or injured by adults were observed during 1982–83 in several herb and flower gardens on the Cornell University campus at Ithaca, New York, and in an herb garden at the Morris Arboretum, Philadelphia, Pennsylvania. A few additional records are based on specimens submitted by a nursery inspector of the Pennsylvania Department of Agriculture. Host plants of *O. coriaceus* in ruderal sites (roadside plantings, railroad right-of-ways, vacant lots, waste areas) are based on personal collecting in the eastern United States during 1974–83. Seasonality was determined by sampling a population associated with mugwort, *Artemisia vulgaris* L. (Asteraceae = Compositae), at Harrisburg, Pennsylvania, in 1983. Plants were observed every few days beginning in late April to detect the appearance of first-instar nymphs. Once the overwintered eggs had hatched (28 April), sweep net collections were made until early June at 7- to 10-day intervals from the nearly pure colony of mugwort (about 20 m^2). After sweeping, the net bag was emptied into a small tray, and the first 10 individuals observed (or all individuals if <10 were found) were placed in 70% alcohol for sorting to stage in the laboratory. When fifth instars appeared in the samples (late May), a supplemental collection was taken 3 days later to check for the appearance of adults. Observations continued until late June when only one adult was collected after extensive sweeping of mugwort. Additional

Fig. 3. Egg of *Orthocephalus coriaceus*. Note the operculum flush with or slightly below surface of chicory stem and visible within oviposition wound.

seasonal history data were obtained in 1983 from a population of *O. coriaceus* developing on various composites at the Morris Arboretum.

Biology

Seasonal history.—Eggs of *O. coriaceus* overwinter in stems of various composites. On chicory and oxeye daisy they are deposited singly or in groups of 2–6 (Fig. 1). The operculum may be exposed so that the white eggs are conspicuous during field observations (Fig. 2), or the operculum may be flush with or slightly below the stem surface (Fig. 3). Eggs inserted deep into stems may be detected by a surrounding dark necrotic area, although in some cases no oviposition scar is apparent.

At the Harrisburg site eggs began to hatch between 26 and 28 April in 1983 (Fig. 4); at the same site in 1974 they had hatched by 23 April. One week later (5 May 1983) second- and third-instar nymphs were present, but third instars are indicated (dotted line in Fig. 4) as appearing somewhat later than second instars. At Philadelphia on 4 May a sample of 10 nymphs indicated a similar development of populations: 1 first-instar nymph, 4 second instars, and 5 third instars. Fourth instars appeared in the Harrisburg sample of 13 May; fifth instars, by 23 May. Although the 31 May sample consisted only of fifth instars, a few adults also were observed on the plants, having appeared since 26 May. At Harrisburg adults of this univoltine species disappeared by late June. Males, which appear a few days

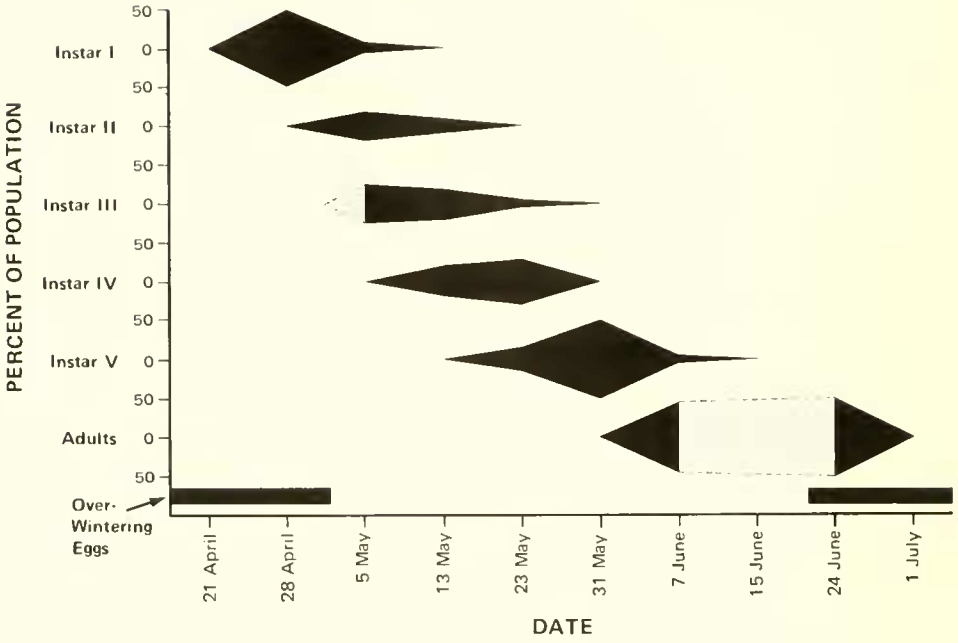


Fig. 4. Seasonal history of *Orthocephalus coriaceus* on mugwort at Harrisburg, Pennsylvania, 1983. Dotted lines indicate extrapolated data.

before females, tend to die somewhat earlier than females so that late-season collections consisted mainly of females.

Host plants and damage.—In this study all hosts of *O. coriaceus* were composites: either widely naturalized Old World members of the flora of eastern North America or exotic Eurasian taxa planted in herb and flower gardens. The most common hosts in ruderal sites were chicory and oxeye daisy (Table 1). Heavily infested chicory plants were conspicuous by their chlorotic foliage, the irregular blotches ranging from yellow to pinkish or reddish. Spotted knapweed, *Centaurea maculosa* Lam., which occurs frequently on dry roadside slopes in Pennsylvania, also was a common host. In New York large populations were observed on tansy growing along a road and a railroad right-of-way. All but one collection in herb gardens was made from plants of the composite tribe Anthemideae. Often damaged by the feeding of *O. coriaceus* were feverfew, Shasta daisy, and other *Chrysanthemum* spp.; *Achillea* and *Artemisia* spp.; and tansy. Injury consisted of chlorotic areas on foliage, which later became unsightly brown blotches (Fig. 5). Black spots of excrement contributed to the unaesthetic appearance of infested leaves.

Descriptions

Kullenberg (1943) described and figured the egg of *O. coriaceus*. A brief description of the fifth-instar nymph was given by Butler (1923). In the nymphal descriptions that follow all measurements are in millimeters.

Table 1. Host plants of *Orthocephalus coriaceus* in eastern United States, 1974–83.

Taxa	Common Name	No. of collections	
		Herb Gardens	Ruderal Sites
Asteraceae			
Tribe Anthemideae			
Achillea decolorans Schrad. in Willd.		1	—[1]
A. filipendulina Lam. × *clypetiolata* Sibth & Sm. 'Coronation Gold'		1	—
A. millefolium L.	yarrow	1	1
A. millefolium 'Rosea'		3	—
A. 'Moonshine'		1	—
A. tanacetifolia All.		1	—
Anthemis tinctoria L.	golden marguerite	1	—
A. tinctoria 'Kelwayi'	hardy marguerite	1	—
Artemisia abrotanum L.	southernwood	3	—
A. abrotanum 'Lemon Scented'		1	—
A. glanduligera Krasch ex Poljakov		1	—
A. pontica L.	Roman wormwood	1	—
A. vulgaris L.	mugwort	—	2
Chrysanthemum balsamita L.	costmary	1	—
C. 'Chiquita'		1	—
C. cinerariifolium (Trevir.) Vis.	pyrethrum	1	—
C. leucanthemum L.	oxeye daisy	—	7
C. parthenium (L.) Bernh.	feverfew	2	—
C. × *superbum* Bergmans ex J. Ingram	Shasta daisy	1	—
Tanacetum vulgare L.	tansy	6	2
T. vulgare var. *crispum* DC.		2	—
Tribe Cynareae			
Centaurea maculosa Lam.	spotted knapweed	—	4
Tribe Cichorieae			
Cichorium intybus L.	chicory	1	7

[1] Not collected.

Fifth instar (in alcohol, n = 5) (Figs. 6–7).—Length, 3.52–4.08, $\bar{x}$ = 3.81. Body stout, elongate-oval, general coloration black; head, pronotum, and wing pads shining black to fuscous, with antennae, head beneath, and abdomen more brown; Y-shaped epicranial suture and thoracic midline pale. Head declivent, tapering anteriorly, with numerous black bristlelike setae mostly in front of epicranial suture, eyes prominent, touching and extending laterally beyond anterior pronotal angles; length, 0.48–0.68; width, 1.12–1.36; interocular space, 0.60–0.76. Antennae with suberect black bristlelike setae, segment I subclavate, II gradually thickened to apex, III–IV filiform; lengths, segment I, 0.32–0.40; II, 0.90–1.00; III, 0.74–0.88; IV, 0.50–0.56. Labium stout, extending to intermediate coxae; lengths, segment I, 0.32–0.40; II, 0.30–0.40; III, 0.10–0.20; IV, 0.16–0.30. Pronotum trapeziform, with stout black bristlelike setae mainly along anterior and lateral margins, wing pads extending to 5th abdominal segment, with scattered erect and suberect bristlelike setae; length, 0.52–0.64; width, 1.25–1.36. Abdomen with numerous suberect setae laterally and dorsally, scent gland opening between ter-

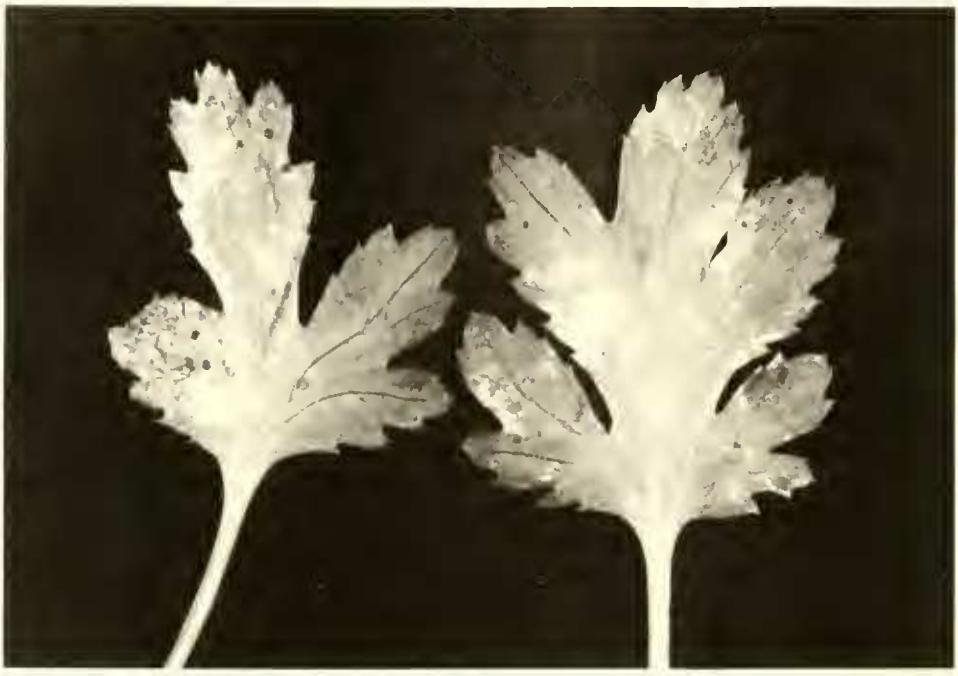


Fig. 5. Injury to foliage of *Chrysanthemum* sp. from feeding of *Orthocephalus coriaceus*.

gites III–IV, tergites with row of prominent shiny black blotches along midline, decreasing in size posteriorly to penultimate segment, last segment entirely black. Legs clothed with stout bristlelike setae, coxae largely pale, femora brown, tibiae and claws fuscous to black. Ventral surface brown, with thoracic pleura shiny black, abdominal spiracular openings surrounded by shiny fuscous area. Genital segment in female with 2 large quadrate fuscous plates, the posterior one divided mesally; male with one large undivided fuscous plate.

Fourth instar (in alcohol, n = 5).—Similar to 5th instar in form and color; wing pads extending to abdominal tergite II. Length, 2.72–3.00, $\bar{x}$ = 2.84. Head, length, 0.34–0.46; width, 0.90–0.98; interocular space, 0.54–0.58. Protergal length, 0.40–0.46; humeral width, 0.82–0.96. Antennal segment lengths, I, 0.16–0.24; II, 0.50–0.60; III, 0.50–0.54; IV, 0.38–0.48. Labial segment lengths, I, 0.24–0.28; II, 0.20–0.26; III, 0.12–0.18; IV, 0.18–0.22.

Third instar (in alcohol, n = 5).—Similar to 4th instar; forewing pads extending to middle of metanotum. Length, 1.44–1.96, $\bar{x}$ = 1.73. Head, length, 0.24–0.30; width, 0.72–0.78; interocular space, 0.42–0.48. Protergal length, 0.46–0.52; humeral width, 0.62–0.72. Antennal segment lengths, I, 0.16–0.20; II, 0.30–0.36; III, 0.34–0.38; IV, 0.32–0.36. Labial segment lengths, I, 0.16–0.20; II, 0.16–0.20; III, 0.10–0.14; IV, 0.14–0.16.

Second instar (in alcohol, n = 5).—Similar in form and color to preceding instar. Length, 1.42–1.54, $\bar{x}$ = 1.48. Head, length, 0.20–0.26; width, 0.58; interocular space, 0.34–0.42. Protergal length, 0.22–0.26; humeral width, 0.50–0.54. Antennal segment lengths, I, 0.12–0.14; II, 0.22–0.26; III, 0.24–0.26; IV, 0.28–0.32. Labial segment lengths, I, 0.14–0.18, II, 0.14–0.18; III, 0.10–0.16; IV, 0.12–0.14.

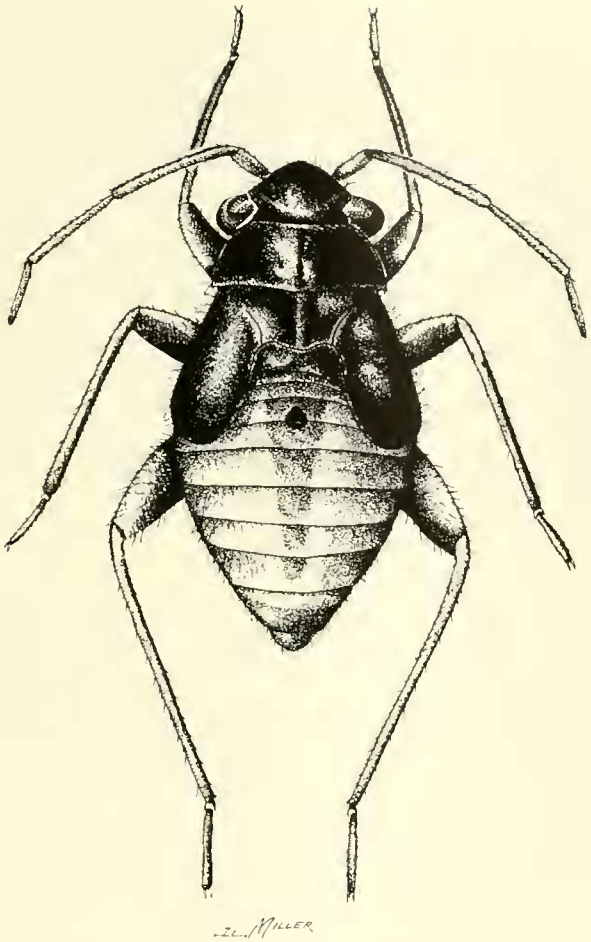
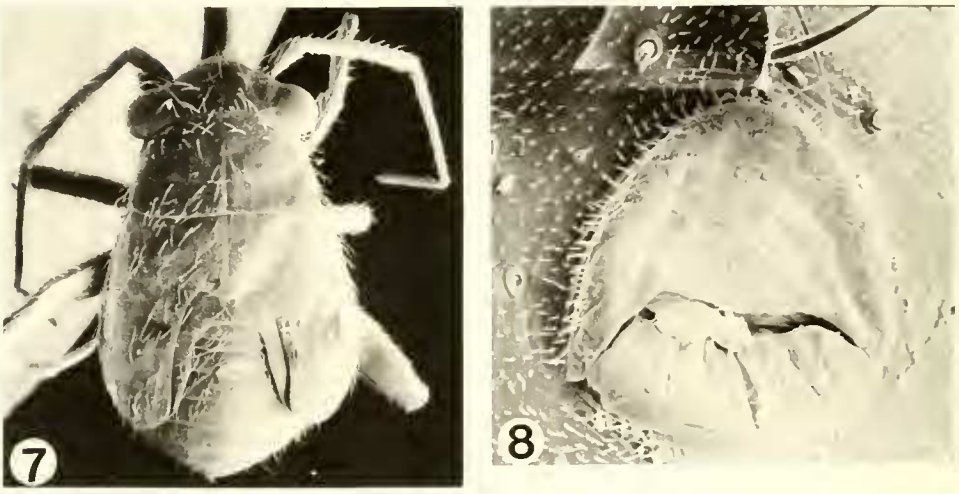


Fig. 6. *Orthocephalus coriaceus*, fifth-instar nymph.

First instar (in alcohol, n = 5).—More elongate than 2nd instar; reddish brown, antennae and legs yellow to tan except fuscous tarsi and claws, nota darker, with extent of dark sclerotized area decreasing from pro- to metanotum, small dark area at middle of abdominal tergites I–II and surrounding scent gland opening. Length, 0.92–1.20, $\bar{x}$ = 1.01. Head, length, 0.16–0.20; width, 0.42–0.44; interocular space, 0.28–0.30. Protergal length, 0.16–0.26; humeral width, 0.34–0.40. Antennal segment lengths, I, 0.08–0.12; II, 0.14–0.18; III, 0.14–0.18; IV, 0.24–0.26. Labial segment lengths, I, 0.10–0.14; II, 0.12–0.14; III, 0.08–0.16; IV, 0.10–0.14.

Remarks.—Although not included in the generic key to fifth-instar Miridae of Wisconsin (Akingbohungbe et al., 1973), the only such key available for the North American fauna, *Orthocephalus coriaceus* will run to couplet 24 with the halticine genus *Slaterocoris*. At the sample site at Harrisburg, nymphs of *Slaterocoris stygicus* (Say) were taken on mugwort, but they may be distinguished from those of *O. coriaceus* by being more shining black and broadly oval, lacking bristlelike setae, having testaceous antennae and legs, and having a simple scent gland open-



Figs. 7–8. Micrographs of *Orthocephalus coriaceus*, fifth-instar nymph. 7, Habitus (28×). 8, Dorsal abdominal scent gland opening (406×).

ing without a tendency toward secondary doubling and with no sclerotized bar above (type 1 of Akingbohungbe, 1974).

The type of abdominal scent gland opening observed in *O. coriaceus* (Fig. 8) deserves comment. Although it is closest to Akingbohungbe's (1974) type 2 (same as type 1 but lacking a sclerotized bar above), there is a semicircular sclerotized area above that appears unlike any of the dorsal abdominal gland openings described and illustrated by Akingbohungbe et al. (1973) or Akingbohungbe (1974). These studies remain the most comprehensive available, but a survey of the world mirid fauna can be expected to reveal additional types of gland openings.

Acknowledgments

I am grateful to T. J. Henry (Systematic Entomology Laboratory, USDA, Washington, D.C.) for allowing access to the U.S. National Museum collection, for providing the SEM micrographs, and for reviewing the manuscript. I thank G. L. Miller (Department of Zoology-Entomology, Auburn University, Auburn, AL) for illustrating the fifth-instar nymph; J. F. Stimmel (Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg) for helping make field collections, for taking the photographs, and for helping prepare Fig. 4; F. G. Stearns (BPI, PDA, Lansdale) for making several collections at the Morris Arboretum; R. J. Henry (BPI, PDA, Gibsonia) for submitting specimens from Shasta daisy; and T. J. Delendick (Brooklyn Botanic Garden, Brooklyn, NY) for commenting on plant nomenclature.

Literature Cited

Akingbohungbe, A. E. 1974. Nymphal characters and higher classification analysis in the Miridae (Hemiptera:Heteroptera) with a subfamily key based on the nymphs. Can. Entomol. 106: 687–694.

Akingbohungbe, A. E., J. L. Libby, and R. D. Shenefelt. 1973. Nymphs of Wisconsin Miridae (Hemiptera:Heteroptera). Univ. Wisc.-Madison, Coll. Agric. Life Sci. R-2561. 25 pp.

Butler, E. A. 1923. A biology of the British Hemiptera-Heteroptera. H. F. & G. Witherby, London. 682 pp.

Carvalho, J. C. M. 1955. Analecta Miridologica: Einige nomenklatorische Berichtigungen für die paläarktische Fauna. Beitr. Entomol. 5: 333–336.

———. 1958. Catalogue of the Miridae of the world. Part III. Subfamily Orthotylinae. Arq. Mus. Nac., Rio de Janeiro. 161 pp.

Fabricius, J. C. 1776. Genera insectorum eorumque characteres naturales secundum numerum, figuram, situm et proportionem omnium partium oris adjecta mantissa specierum nuper detectarum. Chilonii. 14 + 310 pp.

Knight, H. H. 1917. Records of European Miridae occurring in North America. (Hemiptera, Miridae). Can. Entomol. 49: 248–252.

———. 1918. Interesting new species of Miridae from the United States, with a note on *Orthocephalus mutabilis* (Fallen) (Hemip. Miridae). Bull. Brooklyn Entomol. Soc. 13: 111–116.

———. 1941. The plant bugs, or Miridae, of Illinois. Ill. Nat. Hist. Surv. Bull. 22: 1–234.

Kullenberg, B. 1943. Die Eier der schwedischen Capsiden (Rhynchota) II. Arkiv Zool. 34A: 1–8.

———. 1944. Studien über die Biologie der Capsiden. Zool. Bidr. Uppsala 23: 1–522.

Larochelle, A. 1984. Les punaises terrestres (Hemipteres:Géocorises) du Quebec. Fabreries, Suppl. 3. 513 pp.

Reid, D. G., C. C. Loan, and R. Harmsen. 1976. The mirid (Hemiptera) fauna of *Solidago canadensis* (Asteracea) in south-eastern Ontario. Can. Entomol. 108: 561–567.

Reuter, O. M. 1888. Revisio synonymica Heteropterorum palaearcticorum quae descriperunt auctores vetusitiores (Linnaeus, 1758-Latreille, 1806). Acta Soc. Sci. Fenn. 15:1, pp. 243–313.

Slater, J. A. 1974. A preliminary analysis of the derivation of the Heteroptera fauna of the northeastern United States with special reference to the fauna of Connecticut. Mem. Conn. Entomol. Soc., 1974. pp. 145–213.

Southwood, T. R. E. and D. Leston. 1959. Land and water bugs of the British Isles. Frederick Warne, London. 436 pp.

Stear, J. R. 1923. *Orthocephalus mutabilis* Fall. (Hemip., Miridae). Bull. Brooklyn Entomol. Soc. 18: 62.

Thomson, C. G. 1871. Ofversigt af de i Sverige funna arter af gruppen Capsina. Opusc. Entomol. 4: 410–452.

Wheeler, A. G., Jr., T. J. Henry, and T. L. Mason, Jr. 1983. An annotated list of the Miridae of West Virginia (Hemiptera-Heteroptera). Trans. Am. Entomol. Soc. 109: 127–159.